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Chapter 12 - DRAINAGE STANDARDS

CADD Production Criteria Handbook

12.1 GENERAL

The purpose of this chapter is to clarify the development of a Computer Aided Design and Drafting (CADD) project generated by Roadway Design and Drainage Design. (See also Chapter 13) The intent is to provide electronic files that are shareable in a format that the Roadway and Drainage disciplines can use productively.

12.2 STANDARD FILE NAMES

Florida Department of Transportation (FDOT) utilizes standard naming conventions for all of its files. Some of the automation implemented in various tools provided by FDOT depends on naming conventions being met. More importantly, the naming convention confers information to the downstream customer of the data.

Standard file names should follow this format: ***AAAABB##.ext***

Where **AAAA** = abbreviated file description, **BB** = Discipline Denotation, ## =*Sequence number.*

Note *Please see CADD Production Criteria Handbook (CPCH) Chapter 4 for more information.*

The following table defines the Drainage File Name Standards in regards to FDOT Projects with the understanding that each file name will include sequential numbering. For other standard file names refer to the Roadway Chapter, Chapter 13. Since most Drainage files are shared with Roadway, the two groups must coordinate the creation and ownership of these files.

Standard Model names are also provided, however, it is not mandatory to use more than the default model, with the exception of those listed in this table.

File Type	File Name	Model Name	File Description	Rule File	Seed File	Critical File
Borders & Sheets	BDDMRD.dgn	Default	Border Sheet Reference File for Drainage Map Sheet	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Cross Sections	DRXSRD.dgn	Rdxsrd	Drainage Structure Cross Section	drxsrd.rul	$(MX_SEEDIR)fdotseedxs.dgn	X
		Pattrd	Drainage Structure Pattern Lines			
		Xsshrd	Drainage Structure Shapes			
		Rdxsrd_shg	Drainage Structure Cross Section Sheets			
Borders & Sheets	LDPRRD.dgn	Default	Lateral Ditch Plan / Profile Sheet	plprrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Cross Sections	LDXSRD.dgn	Rdxsrd	Lateral Ditch Cross-Sections	rdxsrd.rul	$(MX_SEEDIR)fdotseedxs.dgn	X
		Pattrd	Lateral Ditch Pattern Lines			
		Xsshrd	Lateral Ditch Shapes			
		Rdxsrd_shg	Lateral Ditch Cross Section Sheets			

File Type	File Name	Model Name	File Description	Rule File	Seed File	Critical File
Cross Sections	PDXSRD.dgn	Rdxsrd	Pond Cross Sections	pdxsrd.rul	$(MX_SEEDIR)fdotseedxs.dgn	X
		Pattrd	Pond Pattern Lines			
		Xsshrd	Pond Shapes			
		Rdxsrd_shg	Pond Cross Section Sheets			
Existing Drainage	DREXRD.dgn	Default	Drainage Structures – Existing	drexrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Drainage	DRDTRD.dgn	Default	Drainage Details Sheet	drdtrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Drainage	DRFLRD.dgn	Default	Drainage Flood Data Form	drprrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Drainage	DRMPRD.dgn	Default	Drainage Map	drmprd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Drainage	DROMRD.dgn	Default	Drainage Optional Materials Tabulation	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Drainage	DRPRRD.dgn	Default	Drainage Structures - Proposed	drprrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	X
Proposed Design	PDPLRD.dgn	Default	Pond Design	drprrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Proposed Design	SWPPRD.dgn	Default	Storm Water Pollution Prevention Plan	plprrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Proposed Design	TEXTDR.dgn	Default	Text Labels and Miscellaneous Descriptions	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Proposed Design	WETLRD.dgn	Default	Wetlands Delineation Survey for Drainage	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Summary Boxes / Tables	BRHYRD.dgn	Default	Bridge Hydraulics Recommendation Sheet	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Summary Boxes / Tables	BXCLRD.dgn	Default	Box Culvert / Wing Wall Design and Special Details	drdtrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	
Summary Boxes / Tables	SUMDRD.dgn	Default	Summary of Drainage Structures	planrd.rul	$(MX_SEEDIR)fdotseed2d.dgn	

12.2.1 FILE SHARING AND MERGING

Every project utilizes the standard directory structure regardless of the project requirements. Data for each discipline is maintained in its sub-directory and stored on the TIMS server (In-House). **If a discipline requires information from another discipline, the needed file(s) shall be referenced from the original directory, not copied**.

File sharing among the Roadway and Drainage groups shall be as noted in the table below.

	Roadway Files			**Drainage Files**		
	Read	**Write**	**Create**	**Read**	**Write**	**Create**
Roadway Designer	Y	Y	Y	Y	N	N
Drainage Designer	Y	N	N	Y	Y	Y

12.3 RESOURCE FILES

ECSO provides software resources for CADD Drainage Plans on CD, using MicroStation and GEOPAK for production of drainage plans. GEOPAK Drainage is delivered with the GEOPAK software and uses support files specific to GEOPAK Drainage developed by ECSO. Also, used by some districts for Drainage design, is ASAD (Automated Storm Sewer Analysis and Design). This software is purchased at the district level and is available from Hiteshew Engineering Systems, Inc. Both GEOPAK Drainage and ASAD produce drainage databases that should be delivered with the project upon completion. This information shall be delivered in accordance with Section 12.4.

12.4 ENGINEERING DATA

The Drainage discipline directory contains an additional sub-directory named **\eng_data.** This sub-directory was designated to contain the following:

- PostScript image files of the plan sheets for the drainage design
- Quality Control Reports
- ASCII Engineering Data output files
- Drainage Reports, including the drainage databases used in the development of the reports
- All computer input and output files (Postscript and Native File Formats) used in the structural design of culvert structures
- All supplemental hand calculations (scanned and saved in PDF and PostScript Formats)
- Other data pertinent to the overall drainage design

12.5 PROFESSIONALS' ELECTRONIC DATA DELIVERY SYSTEM (PEDDS)

PEDDS shall be used to Secure and Authenticate project data. When projects are received, the FDOT authenticates the data on the delivered CD. Each time data is transmitted to or received by FDOT the data shall be secured and authenticated. PEDDS shall also be used to authenticate any project specific data received as part of a delivery from an outside source or discipline. For example, an electronic delivery to Roadway from Survey or EMO should be secured and authenticated. Roadway shall electronically secure all files for delivery.

12.6 SYMBOLOGY STANDARDS

FDOT Standard Level Libraries define the FDOT CADD Symbology Standards for each Discipline with the associated ByLevel Color, ByLevel Line Style, and ByLevel Line Weight symbology. Designers are to use these standards to assign each element within FDOT CADD design files. These levels and symbology are grouped and translated into FDOT Standards Rule Files utilized for Quality Control to check compliancy of each FDOT standard design file to the FDOT CADD Standards.

Since Drainage design files meet two indicators that define critical files, files that are shared between disciplines and secondly the elements are used for quantity take-offs, close adherence to the symbology standard should be maintained.

In the event a special needs requirement for specific element symbology or criteria for an entire sheet in the project that is not addressed in the CPCH, the discipline specific Technical Advisory Committee (TAC) shall develop a table listing the critical elements their element symbology. The TAC will consult with ECSO to avoid conflicts with any existing symbology criteria.

The Standard File Names for the Drainage discipline with associated Rule Files are found in Section 12.2 of this chapter.

Note *Refer to Chapter 3 (Resource and Support Files) of this document for more details and complete listing of Rule Files with associated Levels/Symbology information.*

Symbology standards for Existing Drainage items are defined in the Survey Chapter, Chapter 11. The symbology standards for Drainage Structures in cross section view (Drainage Structure sheets) are defined in the Roadway Chapter, Chapter 13.

12.7 PACKAGING

Listed below are files created by Roadway that are to be treated as Drainage files:

- Drainage Detail Sheets (DRDTRD00.DGN)
- Drainage Existing Structures (DREXRD00.DGN)
- Flood Data Form (DRFLRD00.DGN)
- Drainage Map (DRMPRD00.DGN)

(This is not usually in a plan set, but kept on the server. The Drainage Map may be considered as optional to be included in the Final Plans submittal at the discretion of the individual Districts.)

- Drainage Proposed Structures (DRPRRD00.DGN)
- Drainage Structure Cross Sections (DRXSRD00.DGN)
- Summary of Drainage Structures (SUMDRD00.DGN)

Note *For further details on packaging plans, see Chapter 4, Section 4.1.*

12.8 ENGINEERING OF RECORD (E.O.R.)

The CPCH and the Plans Preparation Manual (PPM) provide critical guidelines to differentiate between the responsibilities of the Roadway E.O.R. and the Drainage E.O.R. Each E.O.R. must provide quality control for their discipline specific Production of Plans, CADD files and deliverables. The content and appearance of sheets shall follow all requirements as outlined in the PPM.

12.8.1 ROADWAY ENGINEER OF RECORD (E.O.R.):

This is the responsible engineer in charge of signing and sealing Roadway Plan and Roadway Plan-Profile sheets.

12.8.2 DRAINAGE ENGINEER OF RECORD (E.O.R.):

This is the responsible engineer in charge of signing and sealing:

- Drainage Map sheets
- Bridge Hydraulic Recommendation Sheet sheets.
- Summary of Drainage Structures sheets
- Optional Materials Tabulation sheets
- Drainage Structures sheets (although Roadway Design may do the CADD work)
- Lateral Ditch/Outfalls sheets
- Retention/Detention sheets
- Mitigation Areas sheets

12.9 DRAINAGE STRUCTURES & BOX CULVERTS

12.9.1 PLAN VIEW

Proposed cross drain pipes and box culverts shall be indicated in the plan by a symbol and identified by a drainage structure number. Cross drain pipe sizes and lengths shall be shown.

In accordance with the PPM, the proposed drainage system consists of showing the storm sewer pipes with a single line and drawing the outline of inlets, manholes and junction boxes. The pipe size and length between structures shall be given. Structure numbers shall be provided for inlets, manholes, junction boxes and special structures.

12.9.2 PROFILE VIEW

In accordance with the PPM, storm sewer pipe, inlets, manholes and junction boxes along the main line shall be shown. Pipes shall be noted by size. Proposed structures may be shown by structure number only. Flow line elevations shall be shown for all pipes entering and leaving the structure.

Proposed cross drain pipes and culverts shall be plotted. Cross drains shall be identified by structure number only.

12.9.3 DRAINAGE STRUCTURE CROSS SECTION

In accordance with the PPM, drainage structure sheets shall show the drainage structures, their location, cross section, flow lines elevations of all weirs or slots, top grates, culverts, top of manholes elevations, and similar data. Drainage structures sheets also show the vertical relationship of the entire drainage system. For each drainage structure, all necessary information shall be shown by note, including as appropriate; size, end treatment and flow lines, as well as structure , index, and stations number. Elevations shall be given for manholes tops. And ditch bottoms inlets grates and slots. Grate elevations for gutter inlets and edge of pavement elevations for curb and gutter inlet shall be shown.

Structures should be plotted as sections along the centerline of the structure. They should be shown on a standard cross section format with section spaced sufficiently apart to avoid overlapping of structures or notes. Offset shall be referenced from appropriate baseline or centerlines to the location reference point, which may vary by Index, as indicated in the Design Standards. Beginning at the bottom of the sheet, the section should be shown successively by station and should be numbered sequentially, from the beginning to the end of the project. The structure number and location station should be shown near the right border of the sheet.